

4-WIRE DUPLEX WITH VF RESPONSE EQUALIZER (4WDX/VF) CHANNEL UNIT, 628280, AND 4-WIRE DUPLEX (4WDX) CHANNEL UNIT, 628285

GENERAL DESCRIPTION

	CONTENTS	PAGE
1.	GENERAL	1
2.	DESCRIPTION	1
3.	FUNCTIONAL OPERATION (FIG. 3 AND 4)	2
	TRANSMIT VF CIRCUIT	2
	RECEIVE VF CIRCUIT	2
	SIGNALING	2
	CARRIER GROUP ALARM	5
	BUSY MODE	5
4.	OPTIONS	5
5.	RESTRICTIONS	5
6.	TEST AND MAINTENANCE FEATURES	5
7.	TECHNICAL SUMMARY	6
8.	REPLACEABLE PARTS	7
9.	REFERENCES	7

1. GENERAL

1.01 This Section provides a general description of the ITT D448 4-wire duplex with VF response equalizer (4WDX/VF) channel unit, 628280 (Fig. 1), and 4-wire duplex (4WDX) channel unit, 628285 (Fig. 2), to the functional block diagram level.

1.02 Whenever this Section is reissued, the reasons for reissue will be listed in this paragraph.

1.03 The units provide a voice frequency (VF) and signaling interface between another duplex unit (solid state or relay type) and the D448 multiplex terminal common equipment. In the transmit direction, the units convert VF and signaling information into pulse code modulation (PCM) for application to the common equipment. In the receive direction, the units decode received PCM into VF and signaling information. During system outages, the units provide various disconnect/make-busy routines for the trunk. The units provide a 150-, 600-, or 1200-ohm, 4-wire, 2-way duplex message circuit.

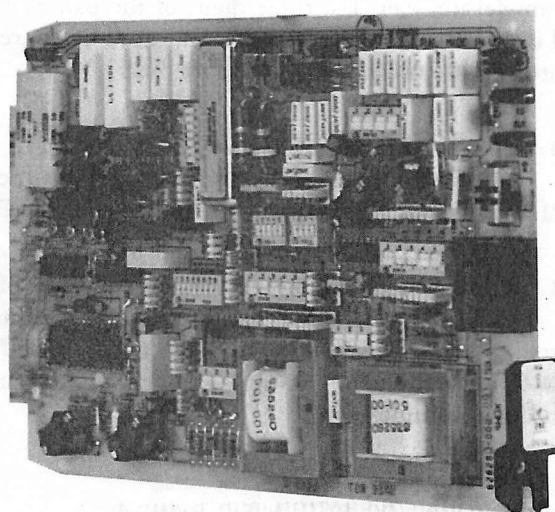


Fig. 1—4WDX/VF Channel Unit, 628280

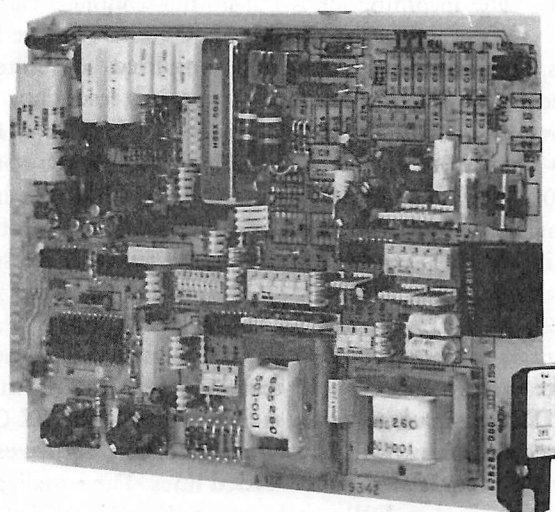


Fig. 2—4WDX Channel Unit, 628285

2. DESCRIPTION

2.01 Each unit mounts in the D448 multiplex shelf (channel unit mounting section) in connectors J1A through J24A (for Digroup A) or connectors J1B through J24B (for Digroup B). Installation procedures for the units are provided in Section ITTR-18-441.

2.02 Each unit is available in Group -0 only.

2.03 Each unit consists of an epoxy-glass printed circuit board (PCB) and associated circuit components. The lower front edge of the PCB is fitted with a handle to facilitate insertion and removal of the unit from the shelf. An identification strip on the handle face indicates the unit mnemonic (4WDX/VF or 4WDX), last three digits of the model number, last three digits of the part number, and issue letter. The part number and issue letter are also located on the component side of the PCB.

2.04 The E LED (DS1), the BSY switch (S11), the splitting card jack (J1), and EQ OUT test points (TP1 and TP2) are located on the front edge of the PCB.

2.05 Printed circuit wiring is etched on both sides of the PCB. The unit inputs and outputs are terminated in gold-plated contacts on the rear edge of the PCB. These contacts mate with a 60-pin contact edge connector on the rear of the multiplex shelf.

3. FUNCTIONAL OPERATION (FIG. 3 AND 4)

TRANSMIT VF CIRCUIT

3.01 The incoming VF is transformer-coupled, via part of the transmit (TX) level DIP switch, to the low-pass/high-pass filter where it is amplified and filtered. (The transformer has a multiple-tapped secondary that allows a 600-ohm impedance to be matched to a 150-, 600-, or 1200-ohm line by the selection of switch options [150], [600], or [1200].) The gain applied to the input signal can be varied over a 31-dB range to compensate for VF input levels from +9.0 to -22.0 dBm (in 1-dB steps) by the selection of TX level DIP switch options [+1], [+2], [+4], [+8], and [+16]. In the 4WDX/VF, the resulting signal is fed, via a VF equalizer circuit, to the TX office wiring loss (OWL) compensation circuit; in the 4WDX, the resulting signal is fed directly to the TX OWL compensation circuit. The equalizer circuit equalizes the effect of long loaded or nonloaded lines. The equalization may be varied by DIP switch options [L], [N]; SL [1], [2], [4], [8]; HT [1], [2], [4], [8]; and BW [1], [2], [4], [8]. TP1 and TP2 provide a monitoring point for the equalizer circuit. The resulting signal is passed to the TX OWL compensation circuit. The TX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps to compensate for wiring/cabling losses. The range for input levels is +9.0 to -23.5 dBm in 0.1-dB steps. The resulting signal is applied to the encoder.

3.02 The encoder converts the VF signal and signaling information (Para. 3.06) to an 8-bit PCM word. When the TX AND gate is activated by the transmit logic unit (TLU) on the TCS4-X and TCS6-X leads, the 8-bit word is applied to the TLU via the TCD bus. The data is clocked out of the unit under control of the 1.536-MHz clock from the TLU.

RECEIVE VF CIRCUIT

3.03 An 8-bit PCM word from the receive logic unit (RLU) is applied to the decoder on the RCD bus. The decoder will only accept the data when the receive (RX) AND gate is activated by the RLU on the RCS4-X and RCS6-X leads. The decoder converts the PCM word into a VF signal and signaling information (Para. 3.08).

3.04 The VF signal is applied to the low-pass filter and passed through to the RX OWL compensation circuit. The RX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps to the signal out of the low-pass filter to compensate for office wiring/cabling losses. The output of this circuit is further amplified. This amplification can be varied over a 31-dB range (in 1-dB increments) by the selection of RX VF level DIP switch options [-1], [-2], [-4], [-8], and [-16]. This provides output levels of +10.5 to -22.0 dBm in 0.1-dB increments with both the OWL and VF level options. The amplified VF is transformer-coupled to the C.O. equipment. The transformer and DIP switch options are identical to those described in Para. 3.01.

SIGNALING

A. General

3.05 Slide switch options [NOR]/[REV] allow signaling leads to be reversed. To compensate for various loop lengths from 0 to 5,000 ohms, DIP switch options [250], [500], [1K], [2K], and [3K] are provided for resistive matching in 250-ohm steps. DIP switch options [A] and [B] provide 4 to 6 μ F capacitive balance in 0.1- μ F steps to compensate for loop capacitance of 0 to 2 μ F between transmit and receive pairs.

B. Transmit Signaling

3.06 When the far duplex unit is idle-ground, this condition is received and applied to the TX signaling (SIG) interface circuit, which in turn applies this information to the encoder. However, the encoder will not process the information until it is signaled on the TA/B lead by the TLU that the signaling frame is upcoming.

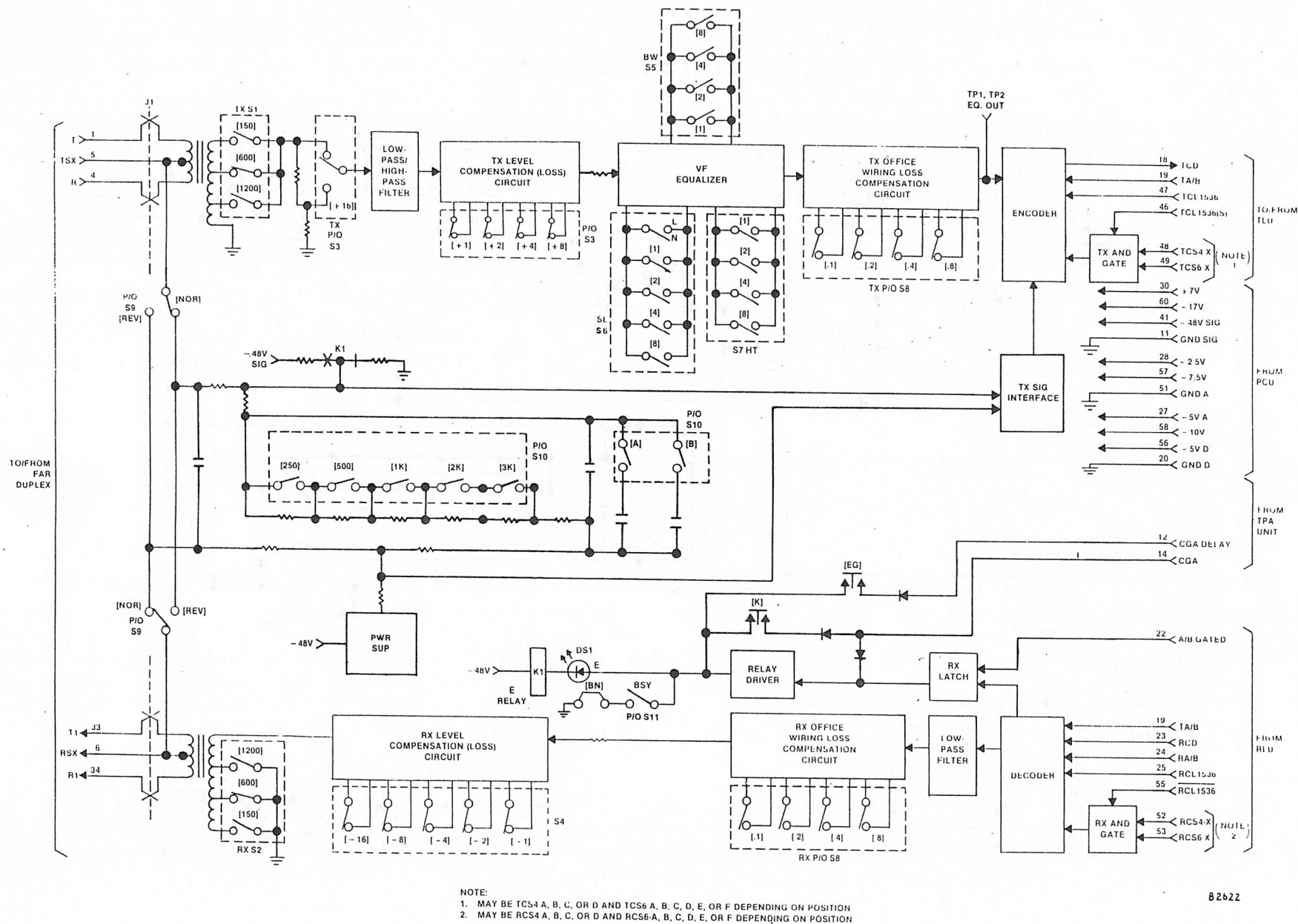
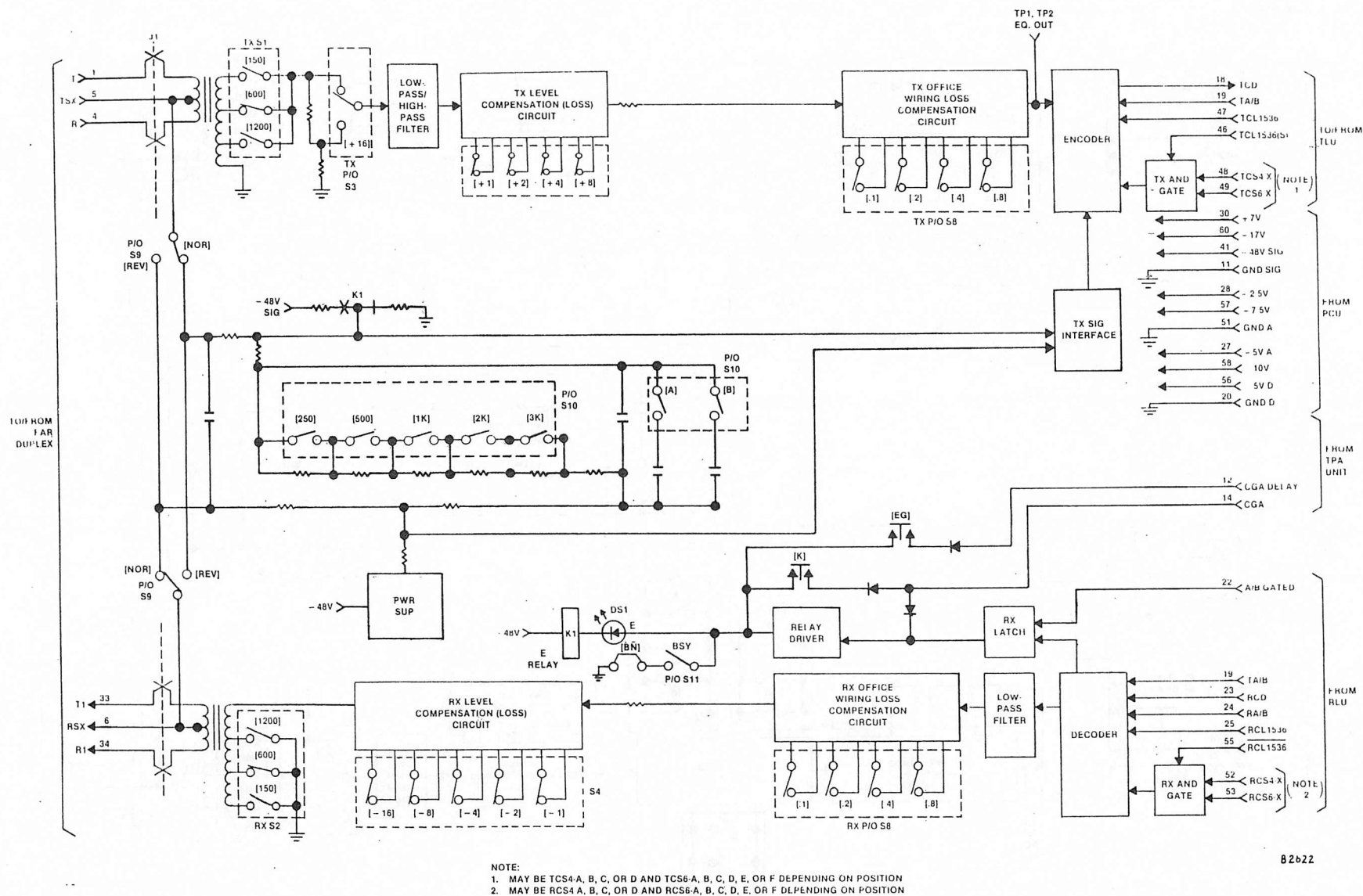


Fig. 3—4WDX/VF Channel Unit, 628280, Functional Block Diagram



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Fig. 4—4WDX Channel Unit, 628285, Functional Block Diagram

3.07 When the far duplex unit is busy, the condition is applied to the TX SIG interface circuit and processed as described in Para. 3.06.

C. Receive Signaling

3.08 The decoder converts receive signaling information from the 8-bit PCM word when it is signaled by the RLU on the RA/B lead that the signaling frame is being processed by the terminal. The decoded signaling information is applied to the RX latch.

3.09 During an idle condition, the E relay is deenergized, the E LED is off, and the idle condition is forwarded to the far duplex unit.

3.10 During a busy condition, the E relay is energized, the E LED is turned on, and the busy condition is forwarded to the far duplex unit.

3.11 During intermittent terminal failures (momentary failures), the RX latch is inhibited from processing signaling information. This results in signaling state storage, which forces the unit to remain in its previous state (idle or busy) during the momentary failure to keep from dropping connections or to keep the unit from being accessed. The signaling state storage is controlled by the RLU. During a momentary failure, the RLU forces the A/B GATED lead low which inhibits the RX latch.

CARRIER GROUP ALARM

3.12 During a system outage, two carrier group alarm (CGA) signals (CGA immediate ground and CGA delay) and the CGA option screws ([K] and [EG]) control the CGA functions of the unit. When a CGA occurs, the CGA lead provides an immediate ground to the unit, and the CGA DELAY lead provides a delayed ground to the unit. Both grounds remain until the CGA condition is cleared. Strapping options on the backplane of the multiplex shelf control when the CGA immediate ground occurs after an alarm signal is received.

3.13 When neither of the CGA options is selected, the CGA immediate ground inhibits the relay driver. With the relay driver inhibited, the E relay is deenergized, if energized, and is forced to stay deenergized during the duration of the CGA. Additionally, the E LED is turned off.

3.14 When option screw [K] is selected, the E relay is energized by the CGA immediate ground causing a busy condition to be forwarded to the far duplex unit. Additionally, the E LED is turned on.

3.15 When option screw [EG] is selected, the E relay is energized by the CGA delayed ground. This results in an idle upon a CGA and following the delay a busy condition is forwarded to the far duplex unit. Additionally, the E LED is turned on when the E relay is energized.

BUSY MODE

3.16 When the BSY switch is placed in the BSY position, and option strap [BN] is installed, the busy condition is forwarded to the far duplex unit.

4. OPTIONS

4.01 The units are equipped with DIP switch options, screw-down options, and strapping options for selecting circuit options. Refer to Section ITTR-18-441 for detailed information on option selection.

4.02 The multiplex shelf provides options on the backplane which control the CGA timing of the terminal. Refer to Section ITTR-18-405 (for shelves mounted in 23-inch bays) or ITTR-18-406 (for shelves mounted in 19-inch bays) for option selection information on these options.

5. RESTRICTIONS

WARNING: These units contain static-sensitive (CMOS) devices. Section ITTR-18-599 contains handling instructions for CMOS-equipped units.

6. TEST AND MAINTENANCE FEATURES

6.01 A description of the test and maintenance features of the unit is provided in Table A. Refer to Fig. 1 and 2 for the physical location of these features.

TABLE A

FEATURE	REF. DES.	FUNCTION
E LED	DS1	Turns on when a busy condition is forwarded to the far duplex unit.
BSY Switch	S11	When placed in BSY position, causes busy condition to be forwarded to the far duplex unit with option strap [BN] installed.
Splitting Card Jack	J1	Provides test/break jack access to C.O. equipment and channel unit sides of T, R, T1, and R1 leads.
EQ OUT Test Points	TP1 and TP2	Provide monitoring point for the equalizer circuit.

7. TECHNICAL SUMMARY

7.01 A summary of technical specifications for the unit is given in Table B.

TABLE B

ITEM	SPECIFICATION
DC POWER	
Voltage	Current Drain (nominal)
GND	19.5 mA (at 5V)
- 10V	2.0 mA (at 5V)
+ 7V	5.0 mA (at 12V)
- 17V	8.0 mA (idle); 12.0 mA (busy) (at 12V)
- 48V SIG Battery	0 mA (idle); 10.0 mA (busy)
VF PERFORMANCE	
Impedance	600 ohms balanced; 150 ohms balanced; or 1200 ohms balanced (switch selectable)
Levels	
Transmit	+ 9.0 to - 23.5 dBm, adjustable in 0.1-dB steps
Receive	+ 10.5 to - 22.0 dBm, adjustable in 0.1-dB steps

TABLE B (CONT)

ITEM	SPECIFICATION
Loss Stability (End-to-End)†	± 0.5 dB over life in 95 % of the circuits
Tracking (End-to-End) - 37 to + 3 dBm0 Input	0.5 dB maximum deviation
- 50 to - 37 dBm0 Input	1.0 dB maximum deviation
Idle Channel Noise (End-to-End)	23 dBmC maximum
Signal-to-Distortion 0 to - 30 dBm0 Input	33 dB minimum overall; 35 dB minimum receive or transmit
- 40 dBm0 Input	27 dB minimum overall; 29 dB minimum receive or transmit (deviation to 1 dBmC for - 21 dBm TLP)
- 45 dBm0 Input	22 dB minimum overall; 25 dB minimum receive or transmit (deviation to 1 dBmC for - 20 dBm TLP)
Single Frequency Distortion (at 0 dBm0) Input Swept from 0 to 12 kHz Input between 1004 and 1020 Hz	- 28 dBm0 maximum at any other frequency - 40 dBm0 or less at any other frequency of 0 to 4 kHz with a distortion contribution objective from either transmit or receive of typically 6 dB better
Return Loss 600 ohms 1000 Hz 300 to 3000 Hz 150 or 1200 ohms 1000 Hz 300 to 3000 Hz	28 dB minimum 23 dB minimum 23 dB minimum 20 dB minimum

TABLE B (CONT)

ITEM	SPECIFICATION
Frequency Response (Referenced to 1020 Hz, End-to-End)†	
200 Hz	0, - 3.0 dB
300 to 3000 Hz	± 0.3 dB
3200 Hz	+ 0.15, - 1.5 dB
3400 Hz	0, - 3.0 dB
Longitudinal Balance (AT&T or IEEE Method)	
200 Hz	66 dB minimum
1000 Hz	60 dB minimum
3000 Hz	58 dB minimum
†600-ohm setting	
SIGNALING	
Dial Pulse Distortion	4% at 10 pps, 60% break, with 5,000 ohms DX loop resistance maximum
OPERATING ENVIRONMENT	
Temperature	0 to + 55°C
Humidity	To 95% at 40°C (no condensation)
Altitude	To 14,000 ft (4,300 m)
DIMENSIONS	
Width	0.8 in. (1.9 cm)
Height	5.9 in. (15.0 cm)
Depth	9.7 in. (24.6 cm)
WEIGHT	1.1 lb (0.5 kg)

8. REPLACEABLE PARTS

8.01 These units have no field-replaceable parts.

9. REFERENCES

9.01 The engineering drawings noted in Table C were used in the preparation of this Section.

TABLE C

TYPE	DRAWING NO.
Assembly	628280-000
Schematic	628280-002
Assembly	628285-000
Schematic	628285-002

9.02 Related information on the units may be found in the ITTR Sections referenced in Table D.

TABLE D

TITLE	SECTION NO.
Connectorized Multiplex Shelf (MS/WC7, MS/WC5, MS/C7 and MS/C6), 628001, 628005, 628011 and 628015 (For 23-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-405
Connectorized Multiplex Shelf (MS19/WC7, MS19/WC5, MS19/C7 and MS19/C6), 628003, 628008, 628013 and 628018 (For 19-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-406
Special Service Channel Units — Option Selection and Installation	ITTR-18-441